1. A method of characterizing the performance of an electrostatic chuck in a first vacuum chamber for use in a second vacuum chamber of a semiconductor processing system in a production line, the method comprising:

providing a first reference value of a first performance characteristic correlated with satisfactory performance of a reference electrostatic chuck when placed in the second vacuum chamber of the semiconductor processing system in the production line and operated under standard conditions of operation;

positioning the electrostatic chuck within the first vacuum chamber;

measuring a first measured value for the first performance characteristic of the electrostatic chuck;

comparing the first measured value of the first performance characteristic with the first reference value, the comparison providing an indication of the performance of the electrostatic chuck; and

based on the result of the comparing step, determining whether the performance of the electrostatic chuck is adequate to install the electrostatic chuck in the second vacuum chamber of the semiconductor processing system in the production line.

2. The method of claim 1, further comprising, prior to the step of measuring, the step of placing a substrate in a supported position on the support surface of the electrostatic chuck.

3. The method of claim 2, further comprising, before the step of measuring, the steps of generating a plasma in the first vacuum chamber and exposing the substrate to the generated plasma.

4. The method of claim 3, further comprising, prior to the step of measuring, the step of applying an RF bias potential to the electrostatic chuck to attract charged particles from the plasma to the surface of the substrate.

5. The method of claim 2, further comprising, prior to the step of measuring, the step of applying a clamping voltage to the electrostatic chuck to create an attractive force that clamps the substrate to the support surface.

6. The method of claim 1, further comprising, before the step of measuring, the step of heating the electrostatic chuck to a first predetermined temperature.

7. The method of claim 1, wherein the first performance characteristic is selected from the group consisting of a current-voltage characteristic, an impedance characteristic, a plasma current-collection voltage characteristic, and a heating/cooling characteristic.

8. The method of claim 1, further comprising, after the step of comparing and before the step of determining, the steps of:

providing a second reference value of a second performance characteristic correlated with satisfactory performance of a reference electrostatic chuck when placed in the second vacuum chamber of the semiconductor processing system in the production line and operated under standard conditions of operation;

measuring a second value for the second performance characteristic of the electrostatic chuck;

comparing the second measured value of the second performance characteristic with the second reference value, the comparison providing an indication of the performance of the electrostatic chuck; and

based on the result of the comparing step, determining whether the performance of the electrostatic chuck is adequate to install the electrostatic chuck in the second vacuum chamber of the semiconductor processing system in the production line.

9. The method of claim 8, wherein the second performance characteristic is selected from the group consisting of a current-voltage characteristic, an impedance characteristic, a plasma current-collection voltage characteristic, and a heating/cooling characteristic.

10. The method of claim 1, further comprising, after the step of comparing and before the step of determining, the steps of:

providing a second reference value of the first performance characteristic correlated with satisfactory performance of a reference electrostatic chuck when placed in the second vacuum chamber of the semiconductor processing system in the production line and operated under standard conditions of operation;

measuring a second value for the first performance characteristic of the electrostatic chuck;

comparing the second measured value of the first performance characteristic with the second reference value, the comparison providing an indication of the performance of the electrostatic chuck; and

based on the result of the comparing step, determining whether the performance of the electrostatic chuck is adequate to install the electrostatic chuck in the second vacuum chamber of the semiconductor processing system in the production line.

11. The method of claim 1, further comprising, after the step of determining, installing the electrostatic chuck in the second vacuum chamber of the semiconductor processing system in the production line.

12. A method of characterizing the performance of an electrostatic chuck in a first vacuum chamber for use in a second vacuum chamber of a semiconductor processing system in a production line, the electrostatic chuck having an electrode, the method comprising:

providing a set of target impedances defining a reference impedance level correlated with satisfactory performance of a reference electrostatic chuck when placed in the second vacuum chamber of the semiconductor processing system in the production line and operated under standard conditions of operation;

positioning the electrostatic chuck within the first vacuum chamber;

selecting a plurality of frequencies within a defined frequency range;

applying a signal across the electrode of the electrostatic chuck at each of the plurality of frequencies, one frequency at a time;

measuring the impedance of the electrostatic chuck in response to the signal at each of the plurality of frequencies to generate a set of actual impedances;

comparing the actual impedances with the set of target impedances for the range of frequencies, the comparison providing an indication of the performance of the electrostatic chuck; and

based on the result of the comparing step, determining whether the performance of the electrostatic chuck is adequate to install the electrostatic chuck in the second vacuum chamber of the semiconductor processing system in the production line.

13. The method of claim 12, further comprising, prior to the step of applying the signal, the step of placing a substrate in a supported position on the support surface of the electrostatic chuck.

14. The method of claim 13, further comprising, before the step of measuring the impedance, the steps of generating a plasma in the first vacuum chamber and exposing the substrate to the generated plasma.

15. The method of claim 12, wherein the electrostatic chuck is a bipolar electrostatic chuck.

16. The method of claim 12, further comprising, before the step of applying, the step of disconnecting any RF power supply that is electrically connected to the electrostatic chuck.

17. The method of claim 12, wherein the step of measuring the impedance provides a measurement selected from the group consisting of magnitude and phase angle.

18. A method of characterizing the performance of an electrostatic chuck in a first vacuum chamber for use in a second vacuum chamber of a semiconductor processing system in a production line, the electrostatic chuck having an electrode, the method comprising:

providing a set of target currents defining a reference leakage current level correlated with satisfactory performance of a reference electrostatic chuck when placed in the second vacuum chamber of the semiconductor processing system in the production line and operated under standard conditions of operation;

positioning the electrostatic chuck within the first vacuum chamber;

selecting a range of voltages;

applying each voltage to the electrode of the electrostatic chuck, one voltage at a time;

measuring a current flowing to the electrode at each applied voltage to generate a set of actual currents;

comparing the set of actual currents with the set of target currents for the range of voltages, the comparison providing an indication of the performance of the electrostatic chuck; and

based on the result of the comparing step, determining whether the performance of the electrostatic chuck is adequate to install the electrostatic chuck in the second vacuum chamber of the semiconductor processing system in the production line.

19. The method of claim 18, further comprising, prior to the step of applying the voltage, the step of placing a substrate in a supported position on the support surface of the electrostatic chuck.

20. The method of claim 19, further comprising, prior to the step of applying the voltage, the steps of generating a plasma in the first vacuum chamber and exposing the substrate to the generated plasma.

21. The method of claim 18, wherein the electrostatic chuck is a bipolar electrostatic chuck.

22. The method of claim 21, wherein the signal is applied to the two electrodes of the bipolar electrostatic chuck.

23. The method of claim 18, further comprising, before the step of applying, the step of heating the electrostatic chuck to a first predetermined temperature.

24. The method of claim 23, further comprising, after the step of measuring, the step of heating the electrostatic chuck to a second predetermined temperature that differs from the first predetermined temperature and repeating the steps of applying and measuring.

25. A method of characterizing the performance of an electrostatic chuck in a first vacuum chamber for use in a second vacuum chamber of a semiconductor processing system in a production line, the electrostatic chuck having a support surface, the method comprising:

providing a target current defining a reference current level correlated with satisfactory performance of a reference electrostatic chuck when placed in the second vacuum chamber of the semiconductor processing system in the production line and operated under standard conditions of operation;

positioning the electrostatic chuck within the first vacuum chamber;

placing a substrate on the support surface of the electrostatic chuck;

selecting a predetermined position proximate an exposed surface of the substrate;

positioning an electrode of a Langmuir probe adjacent the predetermined position;

applying a collection voltage to the electrode of the Langmuir probe;

measuring the current flowing from the plasma to the Langmuir probe;

comparing the measured current with the target current, the comparison providing an indication of the performance of the electrostatic chuck; and

based on the result of the comparing step, determining whether the performance of the electrostatic chuck is adequate to install the electrostatic chuck in the second vacuum chamber of the semiconductor processing system in the production line.

26. The method of claim 25, further comprising repeating the steps of applying and measuring for a plurality of collection voltages to provide an array of current flowing from the plasma to the Langmuir probe as a function of collection voltage and the step of comparing comprises comparing the array of measured currents to an array of target currents to provide an indication of the performance of the electrostatic chuck.

27. The method of claim 25, further comprising, repeating the steps of selecting, positioning, applying, measuring, and comparing for a plurality of predetermined positions to generate an array of current flowing from the plasma to the Langmuir probe as a function of predetermined position and wherein the step of comparing comprises comparing the array of measured currents to an array of target currents to provide an indication of the performance of the electrostatic chuck.

28. The method of claim 25, further comprising, prior to the step of measuring the current, the step of applying an RF bias potential to the electrostatic chuck to attract charged particles from the plasma to the surface of the substrate.

29. The method of claim 25, further comprising, prior to the step of measuring the current, the step of applying a clamping voltage to the electrostatic chuck to create an attractive force that clamps the substrate to the support surface.

30. The method of claim 25, wherein the predetermined position is between the center of the substrate and the outer peripheral edge of the substrate.

31. The method of claim 25, further comprising, before the step of applying, the step of heating the electrostatic chuck to a predetermined temperature.

32. A method of characterizing the performance of an electrostatic chuck in a first vacuum chamber for use in a second vacuum chamber of a semiconductor processing system in a production line, the electrostatic chuck capable of being temperature regulated, the processing system having a vacuum chamber, the method comprising:

providing a target temperature profile defining a reference temperature profile correlated with satisfactory performance of a reference electrostatic chuck when placed in the second vacuum chamber of the semiconductor processing system in the production line and operated under standard conditions of operation;

positioning the electrostatic chuck within the first vacuum chamber;

establishing the temperature of the electrostatic chuck at a predetermined temperature;

discontinuing the temperature regulation of the electrostatic chuck;

measuring the change in the temperature of the electrostatic chuck as a function of time to create a temperature profile; and

comparing the measured temperature profile with a target temperature profile, the comparison providing an indication of the performance of the electrostatic chuck; and

based on the result of the comparing step, determining whether the performance of the electrostatic chuck is adequate to install the electrostatic chuck in the second vacuum chamber of the semiconductor processing system in the production line.

33. The method of claim 32, further comprising, before the step of measuring, the step of generating a plasma by applying a first RF power to excite a pressure of a process gas provided in the first vacuum chamber.

34. The method of claim 33, further comprising, after the step of measuring, the step of generating a plasma by applying a second RF power to excite the pressure of the process gas provided in the first vacuum chamber, the second RF power differing from the first RF power, and repeating the steps of heating, discontinuing, and measuring.

35. The method of claim 33, further comprising, before the step of measuring, the steps of placing a substrate in a supported position on a support surface of the electrostatic chuck, and applying an RF bias potential at a first voltage level to the electrostatic chuck to attract charged particles from the plasma to the surface of the substrate.

36. The method of claim 35, further comprising, after the step of measuring, the step of applying an RF bias potential at a second voltage level to the electrostatic chuck to attract charged particles from the plasma to the surface of the substrate, the second voltage level differing form the first voltage level, and repeating the steps of heating, discontinuing, and measuring.

37. The method of claim 33, wherein the temperature of the electrostatic chuck increases as a function of time.

38. The method of claim 32, further comprising, before the step of measuring, the step of placing a substrate in a supported position on a support surface of the electrostatic chuck.

39. The method of claim 38, further comprising the step of applying a DC voltage at a first voltage level to the electrode of the electrostatic chuck to clamp the substrate to the support surface.

40. The method of claim 39, further comprising, after the step of measuring, the step of applying a DC voltage at a second voltage level to the electrostatic chuck to attract charged particles from the plasma to the surface of the substrate, the second voltage level differing from the first voltage level, and repeating the steps of heating, discontinuing, and measuring.

41. The method of claim 32, wherein the temperature of the electrostatic chuck decreases as a function of time.